DOCUMENT RESUME

ED 396 155 CE 071 898

AUTHOR Perfetti, Charles A.; Marron, Maureen A.
TITLE Learning To Read: Literacy Acquisition by Children and Adults.
INSTITUTION National Center on Adult Literacy, Philadelphia, PA.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
REPORT NO NCAL-TR-95-07
PUB DATE Nov 95
CONTRACT R117Q00003
NOTE 51p.
AVAILABLE FROM National Center on Adult Literacy, Publications, 3910 Chestnut Street, Philadelphia, PA 19104-3111 (order no. TR95-07).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC03 Plus Postage.
DESCRIPTORS Adult Basic Education; *Adult Learning; Adult Literacy; Beginning Reading; Comparative Analysis; Educational Research; *Language Acquisition; *Literacy Education; Literature Reviews; Phonology; Reading Comprehension; Reading Instruction; Reading Skills; Written Language

ABSTRACT

Analysis of research literature shows both important commonalities and differences between how children learn to read and how adults can be taught to read in literacy programs. Both the narrow and broad definitions of literacy are legitimate for specific purposes. The narrow definition identifies literacy acquisition with learning how the writing system works, whereas the broader definition refers to the functional contexts of basic literacy. Learning to read English requires mapping meaningless speech units to meaningless writing system units. Development of reading skills rests on phonological and orthographic components. Some phonological knowledge assists learning how to read, whereas practice at reading strengthens the orthographic-phonological representations of words that are critical in fluent reading. Comprehension is a critical part of reading from the very beginning, although it is largely a general language ability rather than a reading-specific one. Low-literate adults experience the same phonological and lexical failures as children who have difficulty learning to read. Several studies point to adult problems in lexical and phonological processing, and some suggest successful training in phonological awareness. For low-literate adults who show sufficient basic literacy skill, instruction should focus on reading practice. Beyond obvious differences in age and experience, low-literate adults and beginning readers differ in goals and motivations. (Contains 123 references.) (YLB)

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NATIONAL CENTER ON ADULT LITERACY

LEARNING TO READ

LITERACY ACQUISITION BY CHILDREN AND ADULTS

Charles A. Perfetti
Maureen A. Marron
Learning Research and Development Center
University of Pittsburgh

NCAL TECHNICAL REPORT TR95–07
NOVEMBER 1995

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This work was supported by funding from the National Center on Adult Literacy at the University of Pennsylvania, which is part of the Education Research and Development Center Program (Grant No. R117Q00003) as administered by the Office of Educational Research and Improvement, U.S. Department of Education, in cooperation with the Departments of Labor and Health and Human Services. The findings and opinions expressed here do not necessarily reflect the position or policies of the National Center on Adult Literacy, the Office of Educational Research and Improvement, or the U.S. Department of Education.

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LEARNING TO READ

LITERACY ACQUISITION BY CHILDREN AND ADULTS

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Abstract

This report examines whether research on children's reading acquisition can inform adult literacy instruction. It first considers the implications of both narrower and broader concepts of literacy. The report then reviews the literature on (a) how children learn to read, (b) characteristics of low-literate adults, and (c) the practices of adult literacy programs. This review concludes that there are both important commonalities and differences between how children learn to read and how adults can be taught to read in literacy programs. The critical commonality is that both children and adults must learn how their writing system works, which requires knowledge of the sounds of spoken language (phonology) and their connection to print. The important differences are in the social, motivational, and age-related circumstances of children and adults who enter literacy programs. The report concludes that instructional programs can and should provide basic literacy tools while accommodating the special needs of adults seeking literacy.

INTRODUCTION

What is it like to learn to read as an adult? Is it the same as learning to read as a child? Consider parallel questions about learning to play the piano, play chess, or swim. We may be inclined to say that there are no fundamental differences between the child and adult learner in these cases; differences lie in important details—the kinds of explanations an instructor might use, for example—but not in the basics of what is learned nor in the principles that support the learning. By contrast, consider language. Here we are much more likely to conclude that the learning might be very different, perhaps fundamentally different, for the child and adult. Language acquisition is the product of strong biological constraints that produce rapid learning of any language over the first few years of life (Lenneberg, 1967; McNeill, 1970; Pinker, 1984). Even learning a second language may have a critical period, in which early learning appears to be superior to later learning, taking into account the total duration of second-language experience (Johnson & Newport, 1989).

The question, then, in literacy acquisition is whether learning to read is more like learning to play chess or more like learning a language. In the case of chess, we assume that the differences related to age of learning, while significant, are not fundamental. Both children and adults are known to achieve expertise, and the amount of time spent practicing is the major factor that separates chess masters from players of slightly lower skill levels (Chase & Ericsson, 1981; Chase & Simon, 1973). In the case of language, however, we assume that the differences between children and adults are fundamental and that learning is a matter of biological readiness that is stimulated by exposure to language. A young adult who, through anomalous circumstances, fails to be exposed to language as a child is not likely to achieve the same language proficiency when opportunities for learning are presented later (Curtiss, 1977).

In this report, we examine the fundamental nature of literacy acquisition, and then consider the implications of this analysis for adult literacy acquisition. First, we must consider the matter of definitions of literacy.

LITERACY DEFINITIONS

The definition of literacy is especially important when making comparisons between children and adults. There are narrow definitions, broader definitions, and extended definitions, all of which play some role in discussions of literacy. An extended definition, for example, entails the achievement of a broad range of skills that are embedded in cultural and technological contexts. In an extended culture-centered definition, reading may not even be a critical part of literacy; for example, a person who can recite religious texts from memory without being able to read them is included in such a definition (Wagner, 1986; Wagner, Messick, & Spratt, 1986). Other extended definitions imply functional rather than cultural norms. Thus, both the National Association of Educational Progress (NAEP) assessment of literacy in young adults (Kirsch & Jungeblut, 1986) and the National Adult Literacy Survey (NALS; Kirsch, Jungeblut, Jenkins, & Kolstad, 1993) refer to an extended functional definition: Literacy is "using printed and written information to function in society, to achieve one's goals, and to develop one's knowledge and potential" (Kirsch & Jungeblut, 1986; Kirsch et al., 1993). An extended functional definition is of practical use in specifying expectations for achievement and in helping to make clear the wide

range of literacy tasks that a society might present to its members.[1] Further extensions of literacy are entailed when we speak of computer literacy, historical literacy, scientific literacy, and so forth. In such cases, the idea of literacy is taken to refer to a level of achievement in some domain, that is, an extension of basic skill to reasoning and discourse in a domain.[2] (See Figure 1 in the Appendix for a graphical representation of literacy definitions.)

That "literacy" is used in a variety of ways partly reflects a discipline perspective. Reading researchers tend to define literacy acquisition narrowly as reading acquisition. Anthropologists, sociologists, and other social scientists tend to define reading broadly as the acquisition of cultural, social, and educational skills (Wagner, 1986). Each definition brings an important perspective to some aspect of a complex problem. To offer a serious analysis, however, some piece of this complexity has to be the focus of study. For our purposes, we must adopt a relatively narrow definition of literacy, one that refers to learning to read rather than to particular literacy functions. One might argue that it is naive to assume that "reading is reading," as, indeed, the NAEP projects argue in developing a rationale for their emphasis on different kinds of literacy. However, it is clearly the goal of American schooling to promote reading and writing as generalized abilities that will serve learners in a variety of circumstances. Certainly reading a bus schedule, a tax form, and the sports page of a newspaper are three very different activities. Document types bring their own special demands that have to be faced by anyone who wishes to use them successfully. But such observations do not negate a concept of general reading ability (nor learning ability, which is how people come to cope with bus schedules and tax forms). If there are no generalized reading abilities, then there is no useful concept of fundamental literacy. (See Perfetti, 1989, for one kind of argument for generalized reading ability.)

READING DEFINITIONS

There is a parallel between definitions of *literacy* and definitions of *learning to read*. To put this another way, there are differences within the narrow definition of literacy. Broader definitions of literacy acquisition as reading acquisition would emphasize comprehension; narrower definitions would focus on decoding. Still broader definitions embrace not only comprehension, but writing, literature, and all other literacy activities. This all-encompassing approach to the teaching of reading, known as Whole Language, has become dominant in the training of teachers. In schools of education, future teachers are instructed that teaching reading is a matter of helping children learn to "construct meaning" and to "use their prior learning and experience to make sense of texts" (Goodman, 1986, p. 38). At the same time, future teachers are told to keep language "whole," not to break words down into smaller phonemic segments. Teachers aim to make reading and writing meaningful, purposeful, child-centered acts. Notice that these goals

[1]Both the NAEP and the NALS test functional literacy skills in prose, document, and quantitative literacy. Prose literacy measures include a variety of uses of information in texts (e.g., finding a fact in a newspaper article or summarizing a poem). Document literacy measures tap the use of information in tables, maps, and schedules (e.g., estimating arrival and departure times for a bus). Quantitative literacy measures tap the application of mathematical operations based on text information (e.g., adding a restaurant bill and calculating the proper tip amount).

[2]Actually, literacies in domains are not used equivalently. Whereas computer literacy is commonly taken to imply a minimal functional use of computers and acquaintance with technological terms, scientific and historical literacies usually imply a certain level of knowledge obtained and demonstrated through reading and discourse.

are not limited to a particular kind of instructional practice, but could be widely shared among teachers of all pedagogical persuasions.

Broader and narrower definitions are both reasonable; the choice depends on the purpose. If one wants to emphasize an educational goal of literacy achievement, then certainly comprehension should be included, as should writing and other forms of literacy. However, accepting the comprehension definition could be a slippery slope. It assumes that "comprehension is comprehension"; but as the NAEP emphasizes, understanding bus schedules, short stories, and science texts are all different kinds of achievements. The reading skill that is most powerful for all varieties of reading is the identification of printed words. The other generalized components of reading are shared with language processes (Perfetti, 1989).

Disputes over the definition of reading are spurious to some extent, because they confuse reading with attitudes toward education and child rearing. It is possible to speak more unequivocally about reading only if we focus on what it is the child has to learn: *Learning to read is coming to know how one's writing system works*. The child already has knowledge of language. It is the writing system that must be learned: how the child's writing system encodes his or her language. The child who will learn to read English must learn how one writing system works; a child learning to read Chinese learns how a very different writing system works. In achieving this learning, a child will also "learn to get meaning from print." But the real learning that takes place concerns the principles of the writing system. Every other admirable goal of reading education depends on this learning and will not occur without it. (See Perfetti & Zhang, 1995, for further development of this argument.)

In the end, there is no magic in definitions, and practical purposes must prevail. Since our purpose is to examine the relationship between acquisition of literacy by children and adults, we adopt two different definitions and try to make clear what follows from considering one rather than the other. Because we believe that learning to read is a question of learning how one's writing system works, we will state as *Definition 1: The acquisition of literacy is learning how one's writing system encodes one's language*. It is assumed in this definition that a child has a knowledge of language that includes its structural components (i.e., its productive syntactic and phonological machinery) and an acquired store of word form-meaning relationships (i.e., vocabulary). We take this narrow definition as privileged for most of our analyses. Because we believe that at least some of the problems of adult literacy acquisition exceed this definition, we also consider *Definition 2: The function of literacy is the application of literacy (see Definition 1) to a wide range of circumstances across an individual life span*. These circumstances of literacy are variable across individuals, as well as within individuals, over the growth from childhood to adulthood. The functional definition takes account of culture, technology, and age-related demands on reading skill.

In the next section, we review what is known about learning to read, focusing on Definition 1. This definition is not only appropriate, but it is necessary to address the fundamental question of what learning to read is about. We then reconsider the relative merits of Definitions 1 and 2 in examining adult literacy acquisition.

How Children Learn to Read

As we have suggested, the essential problem of literacy acquisition is to come to know how one's writing system works. The problem in saying that reading acquisition is "learning to get meaning from print" is that this formulation doesn't specify a learning problem. Whatever else learning to read is, it is learning. And what is learned is a writing system.

Learning a Writing System

In learning a writing system, the child must learn its design principles and its controlling details. For the child who learns English, Italian, Russian, or Korean, the principle to be learned is the *alphabetic principle*: The writing system encodes the child's language by associating meaningless units (graphemes) to meaningless units of the language (phonemes). The child learning to read in Iran, Egypt, or Israel will learn a modified alphabetic system in which graphic units represent the consonants of the language but often not the vowels. For the child learning Japanese, a different principle, the syllabic principle, must be learned: The writing system encodes the language by associating graphic units with syllables of the language. (Complicating life for the Japanese child is learning a second system, Kanji, borrowed from Chinese and thus basically built on a morphological principle.) For the child learning Chinese, a slightly different organizing principle must be learned, one by which graphic units of the writing system encode units of meaning, or morphemes. Consider this a morphological principle for the moment, although we will suggest below that this is not quite right for Chinese.

What advance information does a child have in learning how his or her writing system works? In learning the native language, the child has had a considerable head start in the biological constraints that represent the universal design features of language (Pinker, 1984). These design features, tacitly known by the young child, allow Japanese, Hungarian, and English to be learned, in their basics, with comparable ease and remarkable rapidity. At first glance, there appears to be little in the design of writing systems that is comparable: no universal grammar (Chomsky, 1986) to constrain the possibilities. Logographic, syllabary, and alphabetic systems appear to differ in their design principles.[3] Furthermore, the fact that so many languages have no written forms is clear evidence for the assumption that writing systems are cultural inventions with neither biological constraints nor any obvious universal design principles. How can the child have any prior tacit knowledge of how his or her writing system might work?

Actually, the situation may not be quite as it appears at first glance, because there does seem to be one very important design feature for writing systems: They represent speech. What separates full writing systems from partial systems, and from all their distant pictographic ancestors, is that their graphic units correspond to elements of spoken language. Furthermore, all systems show some degree of productivity in these correspondences. In an alphabetic system, a small number of letters (26 in English, 21 in Italian, 32

[3] If writing systems were also based on pictographic principles, the possibilities would be much greater. However, it is clear that although pictographic symbols have played a role in the development of partial writing systems, no complete system is pictographic (DeFrancis, 1989; Gelb, 1952).

in Russian) maps onto a small number of phonemes, which produce the indefinite supply of morphemes in any language. Notice that the alphabetic writing system is productive because it uses phonology as its core. The syllabary system has the same productivity, but different units.

By contrast, pure logographies would not be phonologically productive, although they might be morphologically productive. If Chinese were a pure logography, it would be an exception to the generalization that writing systems encode language rather than meanings. And it would slightly weaken any generalization about the centrality of phonology in reading. Thus, it is of some interest to consider whether Chinese might be something other than a pure logography. Consistent with the logography assumption, Chinese characters do correspond generally to morphemes; and they have no letter-like units. However, it is important to note that the morphemes represented by written Chinese are also syllables. This presents an opportunity for a system that encodes both meaning (morphemes) and phonology (syllables). Indeed, rather than a pure logographic system, some Chinese scholars, especially DeFrancis (1989), have argued that Chinese is a mixed morpho-phonetic system. Most single character Chinese words consist of two components, one that can provide a semantic cue (the radical) and one that can provide the syllable that is also the name of the word (the phonetic). Phonological productivity is limited, however, because the phonetic (syllabic) component is unreliable in representing the pronunciation of a given word. For that matter, the radical is also unreliable as a source of precise information about meaning. The details of such a mixed system and the implications for reading are intriguing, but beyond our purpose. The main point here is to suggest that Chinese is something other than a pure symbol-to-meaning mapping system. It does not stand as a clear exception to the generalization that writing systems encode speech.

Our more general conclusion, in agreement with DeFrancis (1989), Mattingly (1992), and others, is that all full writing systems encode the phonological structure of language. There are significant variations to be sure. An alphabetic system is phonologically productive in its core design principle. Chinese is phonological not so much in its core design principle as in the application of its morphological principle. Either as a core principle or as an application device, phonological information is functional in writing systems, which have generally evolved to represent human languages, not ideas or meanings. The implications of this for reading are profound: Reading will not be an independent channel for meaning. It will build on speech.

Learning to Read Alphabetic Systems

In this section, we review some of what is known about how children learn to read alphabetic writing systems, with a focus on English. Because learning to read in an alphabetic system requires learning the alphabetic principle, the central question becomes this: How is learning this principle accomplished? An essential observation made by Gleitman and Rozin (1977) makes the problem clear: The discovery of the alphabetic principle was rather late in coming to the evolution of writing systems. That units of writing could be connected to meaningless units of speech was not an obvious discovery. We should not be surprised that this discovery is also difficult for children who are learning to read.

PHONOLOGICAL AWARENESS

The discovery of the alphabetic principle depends, logically, on noticing that spoken language contains meaningless segments. These segments, or phonemes, can be used in producing speech and understanding it, but that is not enough. To discover that one might let some graphic mark stand for a meaningless segment, such as /t/ or /i/, one must come to an explicit recognition that speech contains these segments. Such a recognition is not easy, for a number of reasons. The segments' specific acoustic forms depend on the environment provided by surrounding segments; phonemes are abstractions over variable acoustic events. Furthermore, the segments lack meaning. The use of language brings meaning into focus, leaving the forms of language, including phonemes, in the background. The forms do their work, providing structure to what a child will produce and input from which meaning is obtained. No child who is ready to read has any trouble "hearing" that *dad* and *mad* are different forms with different meanings. But it is another matter to be able to explicitly attend to /d/ and /m/ as the critical speech units that are responsible for this difference. Phonological awareness, the ability to demonstrate this explicit attention to segments, is thus the critical part of discovering the alphabetic principle. It was a unique discovery in the evolution of writing systems (Gelb, 1952) and it is a discovery that is not made by all children on their own. Relatively few preschool children are able to demonstrate an awareness of phonemes, despite showing awareness of syllables (Liberman, Shankweiler, Fischer, & Carter, 1974).

Through numerous studies in several languages (Blachman, 1984; Fox & Routh, 1976; Lundberg, Olofsson, & Wall, 1980; Stanovich, Cunningham, & Cramer, 1984; Tunmer, Herriman, & Neesdale, 1988), a strong relationship has been established between phonological awareness and learning to read. Other studies have suggested that instruction can bring gains in phonological awareness and, in turn, in reading (Ball & Blachman, 1988; Bradley & Bryant, 1983; Lundberg, Frost, & Petersen, 1988; Mann, 1991; Perfetti, Beck, Bell, & Hughes, 1987; Treiman & Baron, 1983; Vellutino & Scanlon, 1991). Moreover, reading programs that emphasize phonological awareness training have proven to be successful in classrooms (Blachman, 1991; Olson, Foltz, & Wise, 1986; Wise, Olson, Anstett, & Andrews, 1989). One successful method, for example, comes from Lindamood and Lindamood (1975), in a program that emphasizes auditory discrimination and articulation in a way that exposes phonological structures to children. Reading instruction, if it is effective, can help teach the child what he or she needs to know about both the alphabetic principle and phonological awareness. Furthermore, phonological training can remediate problems, at least to some extent, for children who have not learned to read (Blachman, 1987; Olson, Wise, Connors, & Rack, 1990).

There is another side to the phonological awareness issue however. The invisibility of phonological structure makes it difficult to acquire outside of literacy contexts. Adults who have not been exposed to literacy instruction do not spontaneously demonstrate awareness of phonemes. Morais, Cary, Alegria, and Bertelson (1979) compared the performance of two groups of Portuguese adults, one that had recently completed adult literacy training (ex-illiterates), and one that had no literacy training on phoneme awareness tasks (illiterates).The illiterates could not add or delete an initial consonant from an utterance spoken by the experimenter. The ex-illiterates completed the task with ease, suggesting that at least some formal training or experience in an

alphabetic orthography is necessary for segmental awareness, although not always explicit reading instruction (Morais et al., 1979). Moreover, a longitudinal study of first-grade children showed that children could make progress in learning to read with a superficial level of phonological awareness, but that their ultimate level of reading achievement depended on further gains in a deeper kind of phonological awareness (Perfetti et al., 1987).[4]

Furthermore, research suggests that the writing system makes a contribution to phonological awareness. Chinese adults who have learned only the traditional character system show little phonemic awareness, in contrast to those who have also learned pinyin, an alphabetic complement to the character system (Read, Zhang, Nie, & Ding, 1986). Japanese students learning Kanji, the Chinese character system, appear to acquire phonemic awareness, although gradually, because they also learn the Kana syllabary system (Mann, 1986).

Thus, on the one hand, phonological awareness is necessary for reading success; on the other hand, it seems to develop in literacy contexts and to a level associated with the type of writing system. This is an important theoretical conclusion with practical implications: Basic literacy achievement both depends on and promotes a knowledge of the phonological structure of language.

ACQUISITION OF READING SKILL

Knowledge of phonological structure is the central enabling condition of reading acquisition in an alphabetic writing system. But beyond this knowledge, there is a component of reading that defines progress: the child's increasing ability to read words. In discussing this component, we review three theories of learning to read. Then we turn to the question of practice in reading.

THEORIES OF LEARNING TO READ

Theories of reading acquisition have usually framed the question in terms of stages of increasing reading skill. One example of a stage theory comes from Chall (1983); another comes from Marsh, Friedman, Welch, and Desberg (1981). The two theories differ in their level of detail, although the child in both stage theories is described as moving from a nonreading stage through successive stages of skill.

We illustrate stage theories with two simpler theories that have been developed to focus on the child's earliest steps in reading and how a transition to a next step occurs. We then present a nonstage theory that focuses on the representation question (Perfetti, 1991, 1992): How does a reader mentally represent words, and how does that representation change with learning?

GOUGH'S THEORY

Gough and colleagues (Gough & Hillinger, 1980; Gough & Juel, 1991; Gough & Walsh, 1991) have described a two-stage account of reading: an early visual association stage and a second stage of decoding-based learning. In the first stage, the child who lacks knowledge of decoding uses any conceivable source of information in order to discriminate one word from another. In doing this, the child builds up a visually accessible lexicon. Gough and Juel (1991) refer to this first stage as *selective association*, because the basic learning mechanism establishes idiosyncratic associations between some part of a printed

[4]For collections of some of the research on phonological awareness and reading, see Rieben and Perfetti (1991) and Brady and Shankweiler (1991).

word and the name of the word. Under the right circumstances, including an increase in phonological awareness and an intention to encode all rather than just some of the letters of the word, the child can move into the *cipher* stage of true reading. As the child reaches the limits of learning associations, there is pressure to adopt a new procedure, one that is based on the alphabetic principle.

EHRI'S THEORY

An alternative model of what pushes the child through the acquisition process comes from Ehri (1980, 1991; Ehri & Wilce, 1985). In this account, there is no purely visual stage as there is in Gough's account. Children use the names of the letters as cues to word identification from their very first opportunity to read. It is the names of the letters of the alphabet that provide the opportunity. Although letter names do not generally represent the phonemes of words in which they appear, they have enough phonetic overlap to be useful. For example, a child might use the names of the letters J and L to remember the sound of the word *jail*. Learning the alphabet, not necessarily the alphabetic principle, is the key that moves a child into the first stage of reading, resulting in a stage that Ehri (1991) calls *phonetic cue reading*. The acquisition process entails the establishment of word representations that have both phonological and orthographic components.

PERFETTI'S RESTRICTED-INTERACTIVE THEORY

Perfetti (1991, 1992) describes a framework without specific stages to explain the acquisition of word representations, based on a general model of the representation of information in word reading. Learning to read is the acquisition of increasing numbers of orthographically addressable words (quantity acquisition) and the alteration of individual representations along quality dimensions. The two quality dimensions are *specificity*, an increase in the number of position-correct specific letters in a representation, and *redundancy*, the increasing establishment of redundant phonemic representations. The redundancy concept rests on the assumption that word names (pronunciations) are part of the child's earliest representations and that learning adds both phoneme and letter representations. Important in establishing these sublexical connections is first phonemic awareness and then increasing context-sensitive decoding knowledge. Thus, the phonological representations become redundant, existing both at the lexical level and the phonemic level. Together, increasing specificity and redundancy allow high quality word representations that can be reliably activated by orthographic input. As individual words become fully specified and redundant, they move from the functional lexicon, which allows reading, to the autonomous lexicon, which allows resource-cheap reading.

These three theories are mutually compatible and, indeed, share a fundamental assumption that moving into a true stage of reading requires some use of the alphabetic principle and, thus, some knowledge of phonological structure. So that we can later consider the adult learner, we will refer to the Perfetti Restricted-Interactive Framework here as a way to represent the knowledge a learning reader acquires. Figure 2 (see Appendix) shows hypothetical representations over three levels of learning for a low-frequency word. The theory assumes that the representations for regular and

irregular words are not qualitatively different, in contrast to theories that assume that only regular words contain useful phonological information.[5]

PRACTICE IN READING

The Restricted-Interactive Framework is compatible with a very important fact about reading skill: Readers improve with practice. What is it that is improved? Practice improves many components, but central among them is the representation of word forms. Experience in reading allows the increasingly accurate representation of a word's spelling (its specificity), as well as a strengthening of the phonological form connected with the letter string. Practice in reading brings about an increasing facility with words because it heightens the quality of the lexical representation. It turns low-frequency words into high-frequency words.

One benefit of reading practice is that it supports comprehension ability, spelling skill, and vocabulary (Stanovich & Cunningham, 1992; Stanovich & West, 1989). Stanovich and colleagues measured college students' reading experience (or, in their terms, print exposure) and correlated it with measures of cognitive and reading abilities. For the Author Recognition Test (ART), a print exposure measure, subjects were to check the names of 40 real authors and ignore the 40 distracter authors. Subjects who correctly checked more authors on the ART were presumably those with greater reading experience. And those subjects with greater reading experience had better comprehension, spelling, and vocabulary skills. Furthermore, print exposure (as measured by the ART) accounted for variance that was not accounted for by phonological processing in word recognition and spelling in adults (Stanovich & West, 1989). The same relationships hold for children (Cunningham & Stanovich, 1990, 1991).

Notice that the print exposure measures allow differentiation within a relatively homogenous population of literate college-age subjects. Print exposure appears to be the literacy equivalent of the chess case that we introduced at the beginning of the report: Just as practice in chess separates grand masters from merely excellent tournament players, practice at reading separates the skilled college reader from the less skilled college reader.

Thus, this line of research is important in establishing that the amount of reading (exposure to print) makes an independent contribution to reading skill. This contribution appears not to be mediated by phonological processes, which readers must acquire anyway, but rather by the more general facilitation that arises from repeatedly accessing words. It is the dilemma of the less able reader that he or she will not get as much practice as the more able reader. The gap between more and less able readers thus increases with time.[6]

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[5]Regularity refers to the extent to which pronunciation is predicted from spelling. Regular words have pronunciation that are predictable from their constituent letters, whereas irregular words do not. (See Venezky, 1970, for an account of the systematic nature of English spelling.) A related assessment of a word's spelling is its consistency. Consistent spellings are those that produce the same pronunciation for all words using that spelling (e.g., the *-ite* of "kite," "bite," and "site"); inconsistent spellings produce at least some variability in pronunciation (e.g., the *-ave* of "cave," "save," etc., but not "have"). The Restricted-Interactive Model assumes that this variability is represented in multiple connections and gradually loses its impact in context. For example, "i" develops connections to several phonemes after first being only /aye/ if the child has learned the letter name. However, learning eventually produces, in the context of *iron*, an increase in the /aye/ connection and a decrease (inhibition) in all other connections (e.g., /i/).

[6]Stanovich (1986) discusses this rich-get-richer aspect of reading skill, borrowing the Matthew metaphor from Merton (1968) and Walberg and Tsai (1983): "For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath" (Matthew, XXV:29).

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BEYOND WORD READING

If learning to read is coming to know how one's writing system works, the problem of reading acquisition, strictly speaking, ends with the ability to read words. But, as we have stressed in adopting a second, broader definition of literacy, it is the application of this basic reading skill to literacy situations that marks real reading and a reasonable standard of literacy. Few people would be tempted to refer to someone, either an adult or a child, as "literate" unless that person had an ability to do more than read single isolated words. At minimum, one expects comprehension of what is read.

There are several important points to emphasize when raising the standard to include comprehension. The first point is that comprehension is a matter of language understanding and not a unique feature of reading. Only a very broadly extended definition of literacy can justify treating comprehension as a central component of reading. This is not mere definitional dogma, but an issue with serious implications for adult literacy. This is because the two major components of comprehension are poor candidates for literacy training programs. These two major components are basic language comprehension ability and specific content knowledge.

The comprehension research literature is clear in showing profound effects of specific knowledge on comprehension of texts. (See Alba & Hasher, 1983, for a review.) Because relevant knowledge accumulates over an individual lifetime, there will be such enormous knowledge differences among adults that any serious attempt to close a knowledge gap as part of a literacy program would be misguided. Knowledge is a matter of education not remediation. Its contribution, as important as it is to every individual comprehension event, is overrated as a component of reading ability. Indeed, we stress that knowledge should not be considered a component of reading ability, which includes mechanisms that can compensate to some extent for limited knowledge (Perfetti, 1989).

The second component of comprehension, basic language skills, also produces individual differences. Although such individual differences might reflect variability in the operation of basic phonological and syntactic machinery, it is likely that they arise primarily from the general processing constraints of working memory—constraints that limit the retention and manipulation of linguistic information. In fact, years of research have widely supported this working memory bottleneck as a major factor in accounting for individual differences in reading skill (Just & Carpenter, 1992; Perfetti & Lesgold, 1977; Shankweiler & Crain, 1986). It is especially clear that working memory factors constrain the comprehension of both children and adults for both spoken and written language understanding. Although it remains possible that working memory bottlenecks reflect limits of knowledge as well as limits of processing mechanisms, the implications for adult remediation are not especially sanguine on either alternative, at least not in short-lived programs.

The argument here is that comprehension is, indeed, important, but that most of what is important about it is highly general to language, not unique to reading. Evidence for this comes from the high correlations observed between written and spoken language comprehension among adults (Bell & Perfetti, 1994; Gernsbacher, 1990; Gernsbacher, Varner, & Faust, 1990). For children, the correlation between spoken and written language comprehension appears to increase with age (Curtis, 1980), as one would

expect, based on the view that general language comprehension skills show their importance as basic literacy skills are mastered.

If written and spoken language comprehension go together, what about children who can read words but not comprehend what they read? Most likely, the answer to this question is that the frequency of such cases is exaggerated by the anecdotal transmission of impressions of teachers who have not had the luxury of carefully assessing the comprehension and word identification skills of such children (Perfetti, 1986). There is surprisingly little convincing documentation of "comprehension deficits" accompanied by high levels of word identification skill, the assessment of which must include measuring the accuracy *and* the speed of reading single words. Nevertheless, research by Yuill and Oakhill (1991) and Stothard (in press) suggests at least some disassociation of decoding and comprehension skills in children. The question, accordingly, becomes a statistical one: The typical pattern associates word identification and comprehension skill, but an atypical pattern of skilled word recognition and poor comprehension also exists.

There is no doubt that comprehension strategies (knowledge and basic language processes that guide a reader's comprehension) are important in explaining comprehension. But normal variations in such skills are not what one has in mind in referring to extreme cases of "word reading without comprehending." We conclude that cases in which there is total failure to transfer language skills to reading are relatively rare, or have not been convincingly demonstrated.[7] We want to be clear about the obvious fact that there is much more to comprehension than word recognition. We also believe there are comprehension problems that are unique to print. Indeed, there are differences between spoken and written language that should lead to some differences in processing (Olson, 1977; Perfetti, 1985, 1987). Even within the category of written texts, there are differences that lead to particular approaches or strategies, and the mix of processes used in reading change with the goals of the reader. There is much that one must learn to become a truly skilled reader. But nothing is gained by lumping all conceivable strategies that become learned in specific contexts into the problem of basic reading acquisition. Doing so bears a cost to both conceptual clarity and to practical recommendations.

ADULT LITERACY

We return to our original comparison question: Is learning to read as an adult similar to learning to read as a child? We will now suggest a qualified affirmative answer: The process of learning to read as an adult follows the same principles that govern a child's reading acquisition; however, there are important contextual factors, including social and emotional factors, that exert strong influence on the course of learning. (Chall, 1987, argues a similar point.) Both the narrow (Definition 1) and broad (Definition 2) definitions of literacy are relevant for our conclusions about adult literacy. By both

[7]One candidate for a comprehension factor beyond knowledge and basic language processes is comprehension monitoring. Numerous studies point to individual differences in this comprehension strategy (Baker, 1979, 1984, 1985; Baker & Anderson, 1982; Garner, 1980; Oakhill, 1993; Otero & Kintsch, 1992; Vosniadou, Pearson, & Rogers, 1988). A related factor is inference making, which appears to be more characteristic of skilled readers than less skilled readers according to research by Oakhill and colleagues (Oakhill, 1993; Oakhill & Garnham, 1988; Oakhill & Yuill, 1986; Yuill & Oakhill, 1988, 1991; Yuill, Oakhill, & Parkin, 1989). Both lines of research demonstrate an important component of comprehension but leave some uncertainty about the interpretation. For further discussion, see Perfetti, Marron, and Foltz (in press).

definitions, we conclude that a core learning problem is shared by first attempts and later attempts to learn to read, but that important differences in contextual factors must be taken into account when making recommendations for adult literacy programs.

Characteristics of Adult Poor Readers

In this section, we consider characteristics of adult poor readers in light of the narrow definition (#1): The acquisition of literacy is learning how one's writing system encodes one's language. And we consider a specific, although imaginary, population of adult poor readers. The NAEP report (Kirsch & Jungeblut, 1986) suggests that 95% of the nation's 21- to 25-year-olds function at or above the level of a fourth-grade student; according to our definition, we might not expect this 95% to experience basic literacy (i.e., decoding) problems. But we suspect that many of this 95% have had their basic reading skills overestimated by assessments that focus on comprehension skills. In fact, we know little about the basic word identification skill and phonological knowledge of this population, because the NAEP does not test these skills. Furthermore, a high standard of word reading ability is best met by evidence that a student can read a pseudoword, an achievement that is enabled by knowledge of the alphabetic principle and its application to English spellings. Nevertheless, in the interest of a clear analysis of basic literacy problems in a smaller percentage of cases, we will assume that most of the 95% have some problem beyond basic literacy—a problem of general cognitive functioning, lack of relevant knowledge, or social-emotional obstacles to the application of basic literacy skills.

Thus, we consider a minimal group, the 5% of the population that functions below a fourth-grade level, with the recognition that our analysis is relevant to a much larger group. These adults lack basic literacy skills, including skills that enable word recognition. And, consistent with our suspicion that many readers among the 95% have basic word reading problems, is the possible underestimation of basic literacy problems that may arise from surveys.

Stedman and Kaestle (1987), in their review of functional literacy tests, conclude that there is underestimation of the extent of basic literacy problems. They estimate that 20% of the adult population faces difficulties with "common reading tasks." This 20% corresponds to 35 million adults. It is not unreasonable to suggest that some of these adults have difficulties with "common reading tasks" because of lack of basic skills. Stedman and Kaestle estimate that an additional 10%, about another 18 million adults, has marginal literacy skills. It is clear, then, that our analysis applies to millions of adults who would traditionally be exempt from such an analysis by functional skills tests.

The demographics of adult illiteracy are well researched (Kirsch & Jungeblut, 1986; Kirsch et al., 1993). Many adult illiterates belong to minority groups; Black and Hispanic young adults tend to perform worse than White young adults on literacy assessments. For example, a very basic literacy skill is associated with NAEP's 200 level, where a typical task is to identify one matching piece of information in a question and in a text. According to the 1986 NAEP report:

> *95 percent of White, 90 percent of Hispanic, and 82 percent of Black young adults are estimated to be at or above the 200 level. However, by the 275 level, the percentages decrease to 78 percent of White,*

roughly 57 percent of Hispanic, and 39 percent of Black young adults. (Kirsch & Jungeblut, 1986, pp. 65-66)

As the literacy and information-processing tasks become increasingly demanding, the difference in scores increases dramatically. Kirsch and Jungeblut report that across their measures, the average difference between Black and White young adults was roughly 51 to 60 points on the scale; between Hispanic and Black young adults, the point difference ranged between 21 and 27 points, with Hispanics scoring on the higher end. The demographic profile also includes the following: Illiterate adults tend to be economically disadvantaged or impoverished as well as unemployed. Sometimes they are school drop-outs, and before dropping out, had negative experiences with classrooms and learning experiences. They are often the product of homes where literacy activities were uncommon and where parents themselves experienced literacy difficulties and often did not attain high levels of education.

We will variously refer to the lowest 5% of the population as "adult illiterates," "low-literate adults," or "adult poor readers." Although these terms could be used to refer to subtle variations of low literacy, we use the terms interchangeably (as do researchers in the field) to refer to adults who lack basic literacy skills. We expect most of these adults to have some cognitive strategies for recognizing and reading some words. Some of these strategies may correspond to the kinds of nonalphabetic cues that are identified as a stage of prereading (Ehri, 1980, 1991; Ehri & Wilce, 1985; Gough & Hillinger, 1980; Gough & Juel, 1991). Drivers who "read" stop signs by their shape and industrial workers who "read" hazard signs by their symbols exemplify the value of such strategies. Other adults acquire a larger kind of functional "sight vocabulary" in which words are identified, in part, by their familiar graphic appearance. Some of these adults may even have some rudimentary knowledge of the writing system, left over from early years of schooling. Thus some illiterates may have greater word recognition skills than others. However, this group of adults as a whole can be characterized by inefficient and non-automatic word recognition processes.

Whereas much is known about the demographics and functional skills of adults with reading problems, little is known specifically about the nature of the cognitive and linguistic bases of their illiteracy.

PHONOLOGICAL AWARENESS DEFICITS IN ADULT POOR READERS

In contrast to the substantial literature on reading development in children, few studies address reading development in adults. Accordingly, attempts to remediate or instruct adults appear to be largely uninformed by research. However, the few investigations on adults with reading problems converge on an important finding: Adults who are poor readers, either because of childhood reading disabilities or because of lack of training, demonstrate a lack of phonological awareness and problems in phonological processing. On tasks measuring phonological awareness, these adults demonstrate the same failure as do beginning child readers (prereaders) and children with reading difficulties. It is in this respect, the need to acquire phonological awareness and to understand the nature of the writing system, that beginning to read as an adult is like beginning to read as a child. For both children and adults, failure to acquire phonological awareness leads to failure in reading.

In one of the earlier studies, Byrne and Ledez (1983) tested 31 adult poor readers, 20 of whom were attending an adult literacy class, on a phoneme

reversal task. These readers were compared to a demographically similar group of adults who did not show reading problems. Successful performance on this reversal task requires pronouncing a spoken word in the reverse order (e.g., producing *tap* in response to the word *pat*). The poor readers performed significantly worse than the control group, with the very poorest readers unable to answer correctly more than 3 out of 15 total trials. Interestingly, some knowledge of the writing system was demonstrated by the illiterates who occasionally (and incorrectly) responded with rhymes rather than reversals of the test word.

Pratt and Brady (1988) conducted a similar experiment testing phonological awareness with adult basic education (ABE) and Literacy Volunteers students. Control subjects were recruited from more advanced ABE courses. All subjects performed a series of tasks. One task was the Lindamood Auditory Conceptualization Test, in which colored blocks are used to represent phonemes in spoken stimuli; another was a phoneme deletion task. The more advanced ABE readers performed significantly better on both of these phoneme manipulation tasks than the less advanced students; however, the two groups did not differ on a nonspeech task that was analogous in design to the Lindamood Auditory Conceptualization Test. This pattern of differences is consistent with the assumption that the less advanced adult illiterates showed a specifically linguistic deficit. Other studies add to this picture by demonstrating both phonological processing problems and little success on phoneme segmentation tasks in adult populations. Dietrich (1994) found that adults enrolled in a community college course to develop reading skills, despite having some reading ability, performed well below the expected level for adults on the Lindamood Auditory Conceptualization Test. (The mean score for these adults on the Lindamood Auditory Conceptualization Test was the acceptable mean for second-grade readers.) The nonsense word reading ability of these same adults was at a fifth-grade level. Read and Ruyter (1985) found that imprisoned adults with low literacy, when given tests of decoding and segmentation, demonstrated the same pattern as did children who were poor readers. These findings of phonological processing deficits in illiterate adults held for reading-level matched designs (comparing illiterate adults to younger readers with the same score on reading tests), chronological-age matched designs (comparing illiterate adults to adults of the same age), and demographic-matched designs (comparing illiterate adults to literate adults with the same demographics).

Further evidence for phonological awareness deficits in low-literate adults comes from their invented spellings (Liberman, Rubin, Duques, & Carlisle, 1985). In invented spelling, a subject demonstrates knowledge of the alphabetic principle by the use of letters that partially represent the phonemes of the word to be spelled. Children learning to read produce such spellings, for example, spelling *jail* as JL, demonstrating that they are attempting to represent the word's phonology (Chomsky, 1979; Ehri & Wilce, 1985; Read, 1971). Invented spellings, however, are increasingly difficult to interpret as students gain in reading skill. Attempts to spell real words come to reflect knowledge about specific words and beliefs about orthographic conventions that are being acquired. Thus, the spelling of nonwords, which have no orthographic representation, provide a better indicator for older children and adults.

In the Liberman et al. (1985) study, nine adults in a community literacy class were given both real words and pseudowords to spell. On the real word

test, the adults correctly spelled 63% of regular words and 57% of irregular words, but their spelling performance on the nonwords dropped to only 38% correct. (It is not clear whether Liberman et al. were measuring the percentage of correct phonemes or words.) Whereas nonword spelling is a valid indicator of a subject's knowledge of the writing system, the spelling of real words is not, because it reflects memorized sight words. Additionally, these low-literate men were given a phonemic analysis task. They heard a monosyllabic nonsense word and were asked to identify the first, middle, or last phoneme of the word. The adults found the task "frustrating and unpleasant," as well as difficult (only 58% correct).

The performance of Liberman et al.'s subjects suggests that these adults lack phonological knowledge and that they struggle with basic word-form knowledge. They report a telling example: When asked to read aloud the printed word "peg," one subject replied, "Pig? Well, I know it's not pig because there's an *e* in the middle, but I guess I'll go with pig" (Liberman et al., 1985, p. 172). As an indication of how debilitating these reading problems are, the performance profiles of these low-literate adults were found to be very similar to those of kindergarten children who completed similar tasks.

Phonological processing also has been implicated as the primary problem for adult dyslexics (Pennington, Van Orden, Smith, Green, & Haith, 1990). Adults with childhood diagnoses of dyslexia present deficits in phonological processing when compared with reading-matched and age-matched controls (Bruck, 1992). Bruck (1992), however, reported that although the dyslexics never acquired phonemic awareness to an appropriate level, they did acquire an appropriate level of onset-rime awareness. That is, the dyslexics were able to segment a nonword into an onset and rime, delete the onset, and pronounce what remained. For example, when given the nonsense word "voot," the subjects were able to delete the /v/, the onset, and pronounce the remaining "oot," the rime. Treiman (1985) has demonstrated that onset-rime awareness precedes phonological awareness in beginning readers. Thus, Bruck's subjects were learning how to segment their language at a more acoustically accessible level, but not at the less accessible specific segment level on which the alphabetic principle appears to rest.

The clearest case of phonological processing deficits in adult poor readers is the lack of phonological awareness. The case for general phonological processing deficits, however, is strengthened by evidence for slower lexical access and poorer verbal working memory in adult poor readers, although the case for verbal working memory deficits is less clear. Fowler and Scarborough (1993) review studies indicating that adult dyslexics are slower and more prone to errors when naming colors and common objects than a control group of non-dyslexic readers. Slow lexical access persists despite practice. (See Fowler & Scarborough, 1993, for a more complete discussion of these topics.)

Further evidence that a cause of adult reading problems is general phonological deficits comes from Kitz and Tarver (1989), who compared the decoding and phoneme reversal skills of non-dyslexic and dyslexic college students. Although the dyslexics were successful in their college studies, they took almost five seconds longer than did the non-dyslexics to respond to a phoneme reversal task and were significantly poorer at decoding nonsense words. This, and other studies suggest that some basic phonological processing factors are general in the contribution to reading success, across a wide range of reading skills. Difficulties with phonological processing, then, are not unique to the adult illiterate population we are considering. The phonological factors that

continue to play a role in skilled readers are speed and automaticity of word recognition.

For example, in a study of college "pseudodyslexics," Bell and Perfetti (1994) found that low-verbal high-quantitative (SAT) students demonstrated slower processing of words and nonwords, and they were more likely to make errors. They suggest that lexical and phonologically-based skills continue to influence reading achievement even among relatively successful college samples. Stanovich and Cunningham (1992; Stanovich, 1988) draw a similar conclusion based on a larger, less selective college sample. Thus there appears to be a general continuity in the association of phonological and lexical processing with reading success. It links "garden variety" poor readers, dyslexics, pseudodyslexics, children, and adults.

In summary, the available research indicates that low-literate adults perform poorly on tasks that measure phonological processing. Most of this research demonstrates phonological awareness deficits. Research on lexical access time and verbal working memory suggests that phonological problems lead to reading problems—in the word identification and working memory functions that are important in reading success. This evidence, although not decisive on cause and effect, does permit some understanding of the relationship between phonological processes and adult illiteracy. The evidence rules out any simple developmental lag explanations of adult phonological awareness, as Morais et al. (1979) concluded from their study with Portuguese illiterates. Instead, lack of phonological awareness results, in part, from insufficient exposure to an alphabetic orthography. We would, however, make a stronger assertion: It is not mere exposure to alphabetic writing that is important. What is essential, and what illiterates lack, is knowledge of the writing system.

The usual cause-and-effect question asks whether phonological awareness is necessary (cause) for learning to read, or whether it is a result of learning to read (effect). In the case of successful children, we concluded that the answer is "both." Some phonological awareness is, eventually, necessary for success in reading, but it is not an ability that emerges in full strength prior to learning to read. Learning to read promotes and enables greater phonological awareness as the learner comes to grips with the connections between units of the writing system and units of the speech system, consequently increasing the accessibility of the latter. The adult data strengthen this interpretation. We do not conclude that adult illiterates have failed to learn to read because they lack phonological awareness; the origins of their failures are complex and varied. However, their problems in phonological awareness are centrally diagnostic of what they have failed to learn: how their writing system works, including the concomitant insight about phonological segments in speech.

Thus, like the beginning child reader, the adult illiterate needs to learn the alphabetic principle and to acquire phonological awareness in order to become a successful reader.

ADULT LITERACY INSTRUCTION

There are several critical factors to consider in applying our analysis to adult literacy instruction. One is the varying linguistic profiles of adults.

Such variability creates a problem when deciding which model of child reading instruction is appropriate to apply to an adult. The linguistic profile of some low-literate adults parallels that of reading-disabled children. These adults typically lack phonological awareness and show the associated problems of lexical processing. The profiles of other low-literate adults, however, may suggest a parallel to children who are just learning to read. They may have unschooled linguistic abilities, including, at least, elementary phonological awareness, which can create the foundation for literacy. These adults should benefit from good instruction that builds on their linguistic and nonlinguistic knowledge, providing reading instruction that includes some phonological training followed by accelerated reading practice.

Thus, although there is a wide range of adult backgrounds and skills even within adult illiteracy, a first-pass question is possible in considering an instructional program for adult illiterates: Should the model of instruction be based on the beginning reader or the disabled reader? An initial assessment of the adult's linguistic skills, especially phonological awareness can, to a certain extent, help point to the right model. However, choosing one of these two models over the other may be less critical than it appears, and an initial assessment that produces a choice may prove to be misleading.

First, reading-disabled children and children just starting reading instruction face the same task, that is, learning how their writing system works. Adult illiterates, first-grade children, and learning-disabled children all have to acquire the ability to map the writing system onto the speech system, and this includes making phonological structures more visible to the learner. The entering level of phonological awareness is relevant: The less awareness shown by the student, the more instruction is needed. It is important to note, however, that years of illiteracy for an adult do not merely reflect a lack of phonological awareness. More directly, they constitute a prolonged period of *non*literacy. Among the many consequences of nonliteracy is a reduced opportunity to develop the phonological skills that develop in the context of literacy. The reciprocal relationship between phonological awareness and learning to read must be kept in mind. Thus, it might be misleading to simply apply a reading disability model to an adult illiterate who performs poorly on phonological awareness tests.

Less misleading and, at the same time, more helpful than a single phonological assessment is how rapidly the illiterate acquires phonological awareness with instruction. Phonological awareness, in our proposal, is not merely an initial diagnostic to guide an instructional model, but part of a continuing process of monitoring the progress of initial learning. The adult who quickly acquires segmentation ability should be increasingly modeled after the beginning reader and moved rapidly to meaningful reading.

To complicate matters a bit, phonological awareness and word identification skill, may not, in all cases, tell the same story. Some levels of word identification might be achieved without phonological awareness. Thus, adults with low levels of word reading and relatively high levels of phonological awareness may be good candidates for a beginning reader model; adults with (relatively) high levels of word reading and low levels of phonological awareness may be candidates for the disability model. We emphasize again that applying these models to individual cases is not to be recommended. Instead, both word reading and phonological awareness should be assessed and monitored over the first few instructional occasions. All students in the category we are considering are likely to require both phonological training and the opportunity to improve word reading skills in texts. The question for most

students will be the amount of phonological training, relative to practice at reading, required as part of instruction after the initial remediation.

Some might question an emphasis on phonological training for adults on the assumption that phonological deficiencies characterize only a fraction of the adult illiterates who enter into literacy programs. On the contrary, research suggests that phonological processing problems are much more pervasive, extending beyond the conservative 5% assumption that we have made here. Bruck's (1992) study of adult dyslexics and Kitz and Tarver's (1989) study of dyslexic college students, whose achievement level equaled that of nondyslexic college students, demonstrated that phonological processing problems can persist into adulthood. Despite evidence of impaired phonological processing, it is unlikely that the adults in these studies would be classified as illiterate; rather, these adults would fall within the 95% of the population that supposedly has mastered basic literacy skills (Kirsch & Jungeblut, 1986). Thus, the extent of phonological processing problems may be underestimated by a procedure that makes a strong distinction between specific linguistic deficits and more general low reading proficiency.

In summary, we draw two general conclusions. First, reading skill variability among low-literate adults must be taken into account in instruction. Progress in initial learning, however, should replace a single pre-instruction assessment as the benchmark for instruction. Second, training in phonological awareness is appropriate for adults across a fairly wide range of entering reading skill. Although such training is especially important for the portion of the population with serious linguistic deficiencies, adults without obvious linguistic deficiencies may benefit as well.

Decoding in Adult Literacy Programs?

Phonological training, of course, is merely a means, not an end, in literacy training and must be combined with direct reading instruction, including word reading. Decoding, built on the alphabetic principle, is a fundamental process that enables word reading in English, and it must be a part of literacy training. Instructional choices, however, must be sensitive to the unique situations of adult learners. Prior to instruction, an analysis of an adult's skills in the component processes of reading should include measures of reading comprehension, real word identification in isolation, pseudoword identification in isolation and, perhaps, speed of word and pseudoword identification (Fowler & Scarborough, 1993). These measures, which can help select the most appropriate instruction, are currently lacking in assessments of functional literacy skills. Assessments that are used to place adults into instructional groupings have not been found to be especially effective.[8]

As with phonological awareness, we suggest that the monitoring of decoding progress should be a part of early instruction. Students who have had a latent grasp of phonological awareness can make rapid progress in word reading. When students show progress in reading regular words and pseudowords—when they show that they understand the system—they

[8]Venezky, Bristow, and Sabatini (1993) found that the Tests of Adult Basic Education (TABE) Locator is a useful tool to place adult students into the appropriate adult education course. The TABE Locator is a 37-minute test that can be used in place of the traditional hours-long sessments (e.g., the full Tests of Adult Basic Education and the Adult Literacy and Basic Education) and that reduces testing anxiety and frustration on the part of the test taker. The TABE Locator consists of vocabulary and mathematics computation multiple-choice items. Contrary to their expectations, Venezky et al. found that the TABE Locator was a better predictor of class placement than were tests of decoding and oral reading skill. They suggest that decoding and oral reading were not better predictors because many of the subjects were nonnative English speakers.

should be moved very quickly to meaningful text reading. In fact, reading of appropriate texts can be a part of instruction for most students from the beginning. In some form or another, however, many, if not most, adult illiterates need help with fundamental word decoding and, beyond the fundamental, with practice at fluent word reading.

Despite evidence that adult poor readers lack phonological skills, some current adult literacy programs strive to teach metacognitive skills and the application of strategies to get the meaning of the text (Dietrich, 1994). For example, a text used for college-level remedial reading classrooms (McWhorter, 1983) teaches students how to identify the main idea in a passage, how to summarize a text, and how to manage study time. This type of text may be appropriate for many students in the class, including those who are returning to school after a number of years and those who never acquired metacognitive skills during previous educational experiences. Such students may need higher level skills to function with college-level texts more than they need word reading practice. The problem is that a text with a metacognitive approach does not address the fundamental needs of students who have word reading and phonological problems. That college students have such problems has been amply demonstrated (Dietrich, 1994; Kitz & Tarver, 1989).

There appears to be a bias against teaching decoding skills to older students, based on unfounded assumptions about adult learners. For example, one opinion assumes a critical period for learning decoding: "If a student has not mastered decoding skills by grade 8 (or grade X), s/he never will" (Lewkowicz, 1987, p. 51). This pessimistic assessment is without empirical support. Moreover, it is not clear what the alternative is for acquiring reading skill, other than a permanent stage of prereading in which students are forced to use memorization tricks to build up reading vocabulary.

Another unfounded assumption is that adults should be taught to get the meaning of the passage from context rather than from decoding.[9] There appear to be two related assumptions here, one that context provides the means of skilled word identification and one that decoding becomes less relevant in the face of increasing vocabulary demands. "Decoding ability is no longer very important after the middle grades, because there is an increasing load of unfamiliar vocabulary..." (Lewkowicz, 1987, p. 53). The second assumption, that unfamiliar vocabulary becomes an increasing problem, is correct and has implications for instruction. Both middle grade children and adult illiterates with impoverished vocabularies face enormous problems in handling texts, both written and spoken. However, as curriculum content in social sciences, history, and science places increasing demands on fourth- and fifth-grade reading, it renders basic decoding skills not less important, but more important. Subtle deficiencies in word identification skills that can be masked in content-free readers can have severe impact as the student's ability to figure things from context and vocabulary knowledge become insufficient.

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[9]Many teachers have been trained within a framework that treats reading as a problem-solving or hypothesis-testing process. In such frameworks, readers are expected to make meaning out of a text by guessing and predicting what will occur next based on knowledge of language: "Reading is a selective process. It involves partial use of available minimal language cues selected from perceptual input on the basis of the reader's expectation. As this partial information is processed, tentative decisions are made to be confirmed, rejected, or refined as reading progresses" (Goodman, 1967, p. 498). Although using all available information in reading is a good adaptive strategy, the hypothesis-testing view is fundamentally misguided, because it ignores the privileged reliable position of information contained in the word over all other sorts of less reliable information. Liberman and Liberman (1992) provide a cogent critique of this and other misleading and misguided instructions on how to teach reading. They note the example of a classroom poster designed to encourage guessing: "My d__ and I Tr__ to m__ With ch__ and p__." What information could lead to reading with context for this text? This is certainly problem solving with a vengeance! Once one knows the writing system, reading is a lot easier than problem solving.

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The assumption that context provides the means to skilled word identification is counter to the well-substantiated evidence (Perfetti, 1985; Stanovich, 1986) that reliance on context is characteristic of poor rather than good young readers. Moreover, it tries to escape the logic that learning to decode gives readers increased independence in learning. Decoding allows readers to tackle more texts and to read texts with unfamiliar vocabulary. Paradoxically, adults with decoding problems often show high levels of performance on comprehension tests (Fowler & Scarborough, 1993). Adaptive learners, both adults and children, learn elaborate strategies to overcome their word recognition problems. Emphasizing context use over decoding may encourage the further use of such strategies without increasing basic reading skill.

To be clear, the use of context is an important part of intelligent reading and should not be discouraged either in children or adults. Understanding texts, especially the constructing of situation models (van Dijk & Kintsch, 1983) that connect the text to some situation context, relies critically on an intelligent use of context. Our point is simply that context strategies must *accompany* strong word identification skills rather than *replace* them.

The success of phonological awareness training in children suggests such training could be helpful to adults. However, there are surprisingly few studies addressing this important possibility. A recent study (Dietrich, 1994) provides one of the few examples of successful training of phonological awareness in adults. The subjects were 30 community college students (ages ranged between 18 and 40 years) who were registered for a Reading and Study Skills course. Although these adults had more years of education (most had completed high school or a GED program) than those in the studies reviewed earlier, they showed difficulties in phonological processing. One group of students received the standard instruction in metacognitive skills, using the McWhorter (1983) text, and the other group received instruction in phonological awareness, using the Lindamood Auditory Discrimination in Depth Program. The phonological awareness group significantly improved in comparison with the metacognitive group and with their own initial performance in decoding real words and (more significantly) nonwords and on the Lindamood Auditory Conceptualization Task. We are limited in how much we can learn from this study, however, because the exact method of training for each group and the subject assignment into treatment groups are underspecified. Nevertheless, we can take the results of this study to indicate that phonological awareness training increased subjects' understanding of the basics of their writing system, which is a gain in literacy in the narrow sense.

Caution is clearly in order before programs are recommended based on single studies. Not only are more training studies needed, but research also must go beyond the demonstration of training effects to the boundaries of transfer. Without additional training, gains in phonological awareness and decoding that result from training may not lead to gains in other reading skills. Transfer of skills is a serious and highly general problem, regardless of specific instructional procedures. The transfer of a trained skill is usually limited, and its applicability to other situations usually needs to be explicitly modeled. Phonological and decoding training can be applied to text reading, but for this to happen, text reading itself needs to be given a central place at some point in training.

A foundation in phonological abilities can be achieved in a number of ways. The success of a program such as the Lindamood indicates that it has

elements that help lay a phonological foundation. Learners acquire direct visual information about how sounds are made and how these sounds connect with the units of the writing system. Such a program can be recommended for students with a variety of entering skill levels that share a common weakness in phonological awareness and decoding. However, we emphasize that such instruction is not the exclusive means to training, nor should it be expected to take the place of other kinds of literacy activities.

Actual reading is, perhaps, an unequaled training procedure, one that simultaneously strengthens emerging word identification and decoding skills, promotes comprehension, practices reading, and makes clear the rewards of the success. Nothing practices the multiple components of a complex skill quite so well as a task that has all the components. However, it is not enough to give texts to learners at random for practice. The texts need to be matched to the reader's skill level, a level that includes enough of the familiar for true practice. Rereading familiar texts is especially good for such practice (Samuels, 1979). A sound program will include real text reading and training on phonological and decoding processes as necessary.

Questions of adult reading instruction are inevitably larger than particular instructional emphases. These questions include familiar arguments about the philosophy of teaching one to read which, in their current manifestation, include whether or not instruction should follow a "whole-language" approach, as opposed to any instruction that teaches specific skills, including decoding. These arguments are played out in the literature on adult literacy acquisition, although not to the same extent as in the beginning reading field, where the issues are deeply embedded in school-specific contexts of teacher-training, child-development philosophies, teacher and child empowerment, and so forth. Even with these arguments, it is without dispute that all sides want reading acquisition to occur in the most enriching and meaningful environment. The dispute concerns the means to achieve this goal.

Consider the activities that are likely to occur in a direct code elementary-level classroom. The teacher's goal is for students to acquire the alphabetic principle, the principle that controls their writing system and allows reading to be productive rather than based on memorization of word forms. This goal reflects the assumptions that reading depends on spoken language (Gough & Hillinger, 1980) and that most children need at least some instruction on how the writing system works. To this end, the teacher will instruct children in letter-to-sound correspondences, for example, by pointing to the letter S on the board and making its sound. As children acquire more correspondences between graphemes and their associated phonemes, they acquire the ability to read productively. Although some programs may do so, good direct code classrooms do not isolate the learning of letters and sounds from the meaning-getting purpose of reading, contrary to standard criticisms of direct code instruction. Consistent with broad literacy-based instruction, lessons can be part of the reading of literature and also part of writing.

Now consider the activities that are likely to occur in a whole language classroom. The teacher's goal here is to help children extend their natural talents in language to other forms of literacy. The teacher's underlying philosophy is likely to be that reading is a natural extension of spoken language, and just as children naturally and easily speak, they will naturally read (Altwerger, Edelsky, & Flores, 1987). Thus, children do not receive instruction on letter-to-sound correspondences because that would make reading less natural (by breaking it up into pieces) and would be inconsistent with the idea of the wholeness of language. To read, the child is to use his or her knowledge of

language to predict text content (Goodman, 1967). The child is encouraged to engage in literacy activities, such as reading library books, writing letters, and sharing stories with other students. Although these literacy activities have long been part of classroom practice, the whole language movement reemphasized the importance of these types of activities (Adams, 1990). For an adult literacy program, a whole language approach would emphasize using literacy skills in many situations as well as using texts with familiar subject matter and predictable content so that the readers may use context and their knowledge of the topic to glean the meaning (Malicky & Norman, 1989).

For literacy questions of both children and adults, the whole language discussion confuses empirical and theoretical issues about reading with questions of educational and social philosophy. A definition of literacy is the meeting ground of these diverse questions. Whole language programs strive to empower individuals to create a global, culturally bound, personal literacy, suggested by Definition 2. They want readers to engage in those activities that actually define such literacy. Direct code programs (and more eclectic skill programs), on the other hand, strive to equip readers with the basic literacy skills that comprise learning of the writing system (refer to Definition 1) and independence in reading. This basic literacy is assumed to be foundational for other extensions of literacy. Separating these issues of philosophy and ideology, although an unacceptable move according to some whole language advocates (Edelsky, 1990), helps bring the reading picture into focus. Reading instruction, by whole language principles, must not fail to teach readers how to read words, which are the building blocks of all spoken and written texts.

For reading words, which is enabled by learning one's writing system, the research suggests that it is useful to teach directly how the writing system works. For children, reading programs that include systematic instruction in decoding as *part* of their program produce more successful readers than those programs that do not (Adams, 1990). As we have already observed, teaching adults how to decode words through direct instruction does not imply meaningless tasks unrelated to "real" reading. Instruction in decoding not only can be embedded in meaningful tasks and materials, it can also be done in a whole language classroom, at least one that couples a philosophical preference for natural literacy activities with an adaptive attitude toward the basic skills required by the nature of the writing system.[10]

Decoding instruction needs to be responsive to the needs of the learner. As Adams (1990) notes, while instructional principles remain the same, instructional practice must change with the age of the learner. For example, adult poor readers may be motivated to learn basic skills through computer-based instruction. Other adults may be motivated by reading material that is linked to their specific job or recreational interests.

There are some limits, however, to the need for individual adaptations in instruction. Distinctions among dyslexic and learning-disabled readers, which are useful for specialized instruction and training in childhood, may be less relevant for adults (Fowler & Scarborough, 1993). The same kind of reading instruction may be appropriate regardless of whether the reading problem originated from a genetic basis, a linguistic deficiency, or a

[10]By adaptive, we mean an instructional approach that accommodates rather than ignores the basic facts of literacy instruction. Ideologically-driven approaches can be successful to the extent that actual practice is adaptively inconsistent with the most unsound teachings of the system.

cognitive basis. A prolonged period of low literacy coupled with widely different personal circumstances may be more powerful considerations than details of the origins of the reading problem. A lifetime of potential Matthew effects (Stanovich, 1986; see Footnote 6) characterizes many low literacy adults (Fowler & Scarborough, 1993).

Consider an adult illiterate who, as a child, failed to learn to read for one of a number of reasons. Perhaps he had a specific reading disability; perhaps he was victimized by a low-literacy home environment coupled with instruction insufficient to compensate for it; perhaps there was a severe mismatch between the culture of school and the culture of home. Whatever the origins of the first problems in reading, the concomitant negative feelings led the child to avoid more "advanced" reading activities, such as reading books. Avoidance of reading, in turn, deprived the child of practice at reading words and also limited the amount of knowledge he acquired. Reading success became not just difficult, but increasingly difficult, following the initial failure. The original marker of low literacy, an inability to read and decode words, remains. The details of the initial failure may be less important than the many years of low-literacy activities.

READING PRACTICE

Knowledge of a writing system can be determined in a simple manner: testing the ability to read orthographically legal nonwords (i.e., pseudowords). In the absence of any neurological problems, a failure at pseudoword reading indicates a misapprehension of the writing system. An adult who cannot read pseudowords needs direct instruction on the writing system, some combination of decoding and phonological awareness instruction. Conversely, an ability to read pseudowords implies an understanding of the writing system, and instruction on something else is implied. A low-literate adult who can pass the pseudoword test needs something beyond instruction in how the writing system works. If word reading is slow and takes great effort, graded reading practice is suggested.

Practice in reading is critical to success in reading for a number of reasons, most of which point to the development of orthographically addressable word representations (Perfetti, 1992). Although research has not directly addressed the nature of word representations in adult poor readers, the Restricted-Interactive Model can serve to consider how practice in reading leads to the development of superior word representations. Because the Restricted-Interactive Model does not postulate stages of reading development, it can apply readily to adults, for whom stages based on the experiences of 5- and 6-year-old children may be less relevant.

Practice in reading is important to build up orthographic knowledge. The research of Stanovich and colleagues (Stanovich & Cunningham, 1992; Stanovich & West, 1989) has demonstrated that exposure to print accounts for variance in verbal skills that is not accounted for by phonological processing, general IQ, or comprehension ability. Adults with reading problems have had limited exposure to print. They tend to come from low-literate households, and they receive information primarily from non-print media—TV, radio, or acquaintances (Kirsch et al., 1993). For these low-literate adults, a dramatic increase in their exposure to print, in the form of active meaningful reading, is an essential part of any literacy program.

According to the Restricted-Interactive Model, this exposure to print is beneficial because it increases the specificity of orthographic representations.

The reader becomes more familiar with the form and spelling of the word.[11] Thus, one dimension of a word's representation, its specificity, is enhanced, allowing more reliable (and faster) contact of the orthographic form with the phonological form and its meanings.

In addition to exposing a reader to print, practice in reading allows the reader to match orthographic forms to (spoken) phonological representations. This improves the quality of the phonological representation. An additional benefit of practice is that it enables the orthographic and phonological representations to make strong connections with each other, providing opportunities for the two forms of representation to interact and mutually influence each other. The end result is a well-specified, high-quality word representation that is automatically retrieved during reading. The prevention of a processing bottleneck during lexical access frees resources to allow the reader to concentrate on constructing the meaning of the sentence or text.

Because reading can lead to learning, there is also a higher level importance to practice in reading. A skilled reader expands his or her knowledge base with reading, which in turn removes some of the limits on what can be read. In an ideal case, reading habits will show a snowball effect, expanding personal literacy abilities and, as a result, self-esteem.

How Adult Reading Acquisition Differs From Childhood Acquisition

Instructional programs aimed at adult literacy need to take into account the social and motivational differences between adult learners and children. Adults come to literacy programs from different backgrounds, sometimes motivated by specific personal or occupational goals, and other times merely complying with some requirement imposed by others. Their self-esteem is often low, a consequence of years of negative schooling and home experiences. They have dealt with feelings of stupidity and embarrassment that result from perceiving the negative attitudes expressed toward those who cannot read. These constitute serious obstacles to learning.

The one advantage that at least some adults appear to have over children, in this otherwise pessimistic scenario, is a clear sense of purpose. If the value of reading is sometimes not clear to a child, it is clear, in one form or another, to many adults who come voluntarily to an adult literacy program. With a focus on the positive outcome of improved reading skill, a low-literate adult can be a strongly motivated student, one receptive to instruction. Capitalizing on this motivation to learn is a significant edge for an adult literacy instructor.

Nevertheless, not all adults come to literacy programs with a clear sense of purpose, and instruction needs to be responsive to the range of variation in this component. Taylor, Wade, Jackson, Blum, and Goold (1980) interviewed 17 adults enrolled in adult literacy programs, and found great variability in the needs and motivation of the participants. For example, one was a young mother who was embarrassed at not being able to read books to her children. Another was a woman whose specific goal was to learn how to read in order to receive her General Educational Development certificate (GED), but who wanted to continue reading for personal satisfaction. Two other participants showed very different motivations. One man was in the program because it was a requirement of his parole from a youth detention

[11] Phonology plays a role in developing these representations. The spelling options, and thus word representations, are constrained by phonological information in spoken word representations.

center. Another wanted to learn to read only for the purpose of receiving his GED certificate so that he could join the Air Force, and he did not intend to read for pleasure following the class. A single set of reading tasks or a common curriculum is unlikely to appeal to people with such variable goals.

It is not clear what such individual differences imply for adult literacy instruction beyond the obvious observation that instruction must be adaptive to such differences. Even if it were clear, designing a training program for adults is a sizable task, and individualization adds to its complexity. Not only do adults approach such programs with different goals and motivations, but they come to such programs with varying degrees of skill. Likewise, adults have had substantial, but variable, experience in the world; their knowledge of domains is likely to vary. It is important to assess the adult reader's needs and to tailor the instruction situated to exploit his or her interests. To the extent feasible, each student should be allowed to select his or her own reading materials. These texts can become specific goals for reading progress: Something the student wants to be able to read can become an incentive for learning and a target for achievement.

Instruction Beyond Definition 1

Although lack of basic literacy skills may affect only a relatively small percentage of adults, the actual number of such adults is substantial and may be underestimated (Kirsch & Jungeblut, 1986; Kirsch et al., 1993; Stedman & Kaestle, 1987). Many adults, however, have literacy problems that are in line with a broader definition of literacy, the type of literacy that is measured by functional tests.

The National Adult Literacy Survey (NALS; Kirsch et al., 1993), using the same definition of literacy and the same tasks as Kirsch and Jungeblut (1986), reported the varying and often disappointing levels of literacy in the United States. The NALS reported levels of prose, document, and quantitative literacy. We focus on prose literacy because it involves reading and interpreting textual materials, the processes following from successful word recognition. Level 1, encompassing 21% to 23% of the adults in the United States (40 to 44 million people), is the lowest level of literacy. (Our defined 5% falls below Level 1.) A prose literacy task typical of Level 1 is to find one piece of information in an article in response to a question that asks for the information with identical or almost identical wording. Another estimated 25% to 28% of the adult population (50 million people) performs functional tasks consistent with Level 2. A prose task in Level 2 required the participants to locate two pieces of information in a news article. A sample prose task from Level 3 required the participants to write a letter explaining a billing error. An estimated 61 million adults, or 33%, of the adult population, falls within Level 3. Level 4 tasks involved reading two editorials and contrasting the views presented in them. Interpreting a lengthy news article is a sample Level 5 prose literacy task, the highest literacy level on this scale and the least populated level (8 to 21% of the adult population, or 34 to 40 million adults; Kirsch et al., 1993).

Survey participants in Levels 4 and 5, who make up the smallest portion of the adult population, function at a relatively high level. Not surprisingly, those in Levels 4 and 5 are better educated, employed at better paying jobs, and generally experience few difficulties functioning in everyday settings. The participants who fall within the first three levels are less educated, less well paid, and less able to function in everyday settings than the adults in top levels. Kirsch et al. (1993) suggest that the problems these adults face are related to more general cognitive factors, such as their metacognitive ability (i.e., their

ability to reflect on and be aware of their own thoughts and cognitions), problem-solving skill, and information-processing capacity.

In interpreting the results from literacy surveys, the historical increase in literacy standards is relevant. As society's demands on literacy have produced higher standards, more people fail to reach those standards (Stedman & Kaestle, 1987). At one time, the ability to sign one's name was proof of literacy (Resnick & Resnick, 1977). A national shift to universal literacy, understood as reading and writing, necessarily brought greater opportunities for failure. Currently, still higher standards are developing as demands for a technologically trainable and problem-solving workforce become increasingly accepted. To meet these higher standards of universal literacy, training in higher level thinking and reasoning skills is critical (Miller, 1988; Resnick & Resnick, 1977). Moreover, a serious commitment to the "universal" part of the national literacy standards is necessary, unless the new literacy is to become an echo of the old literacy, that of an educated elite and an illiterate work force.[12]

THE NATURE OF THE PROBLEM

Learning to read in a broader sense (i.e., learning to get meaning from a text) presents problems beyond word identification to both children and adult learners. As successful readers acquire word identification skills, they naturally transfer their abilities of language comprehension to written texts. When they fail to understand a text, they need to ask questions, reread the text, or otherwise repair their comprehension problem. For this comprehension repair, they must be aware of their current level of understanding and be motivated to achieve understanding. In addition to this comprehension-monitoring ability, they need to apply the basic strategies that are assumed by written texts: calling on their relevant knowledge, making inferences, and attending to important information. These comprehension strategies appear to emerge as relatively natural transfers of cognitive and language skills for most readers. For some, however, failures in these comprehension strategies can be obstacles to text understanding. For these poor comprehenders, literacy instruction can include appropriate comprehension training.

Two related problems associated with poor comprehenders are comprehension monitoring and inference making (Oakhill, 1993; Oakhill & Garnham, 1988; Yuill & Oakhill, 1988, 1991; Yuill, Oakhill, & Parkin, 1989. For a critical discussion of these issues, see Perfetti, Marron, & Foltz, in press). Although the fundamental source of these twin problems is not completely clear, it is clear that effective comprehension requires overcoming them. If readers fail to make inferences that make the text interpretation coherent, their understanding has to be incomplete or even anomalous. And without comprehension monitoring, readers will fail to notice the interpretation problem. The combined result of these problems is a failure in initial comprehension and in comprehension repair. Research suggests that these problems can be addressed by training. Yuill and Oakhill (1988) successfully trained less skilled child readers to monitor their comprehension and to make inferences. Their program taught children to examine individual words in a sentence, to predict missing sentences, and to generate questions. Such a program can help readers appreciate that they must make inferences in

[12]The new standards imply a more profound contrast, not the 19th-century contrast between the elite and the workers, but a contrast between the workers and the permanently employed.

order to fully understand a text. Moreover, by encouraging question-asking, it can help readers take a more active stance in their attempts to understand, with a resulting increase in their comprehension monitoring.

Of course, these higher level comprehension problems can also be seen in adult reading. Less skilled comprehenders often fail to detect blatant inconsistencies in a text. Moreover, the inconsistencies that they do detect in texts may be less significant to the meaning of a passage than the inconsistencies detected by skilled comprehenders (Baker, 1979, 1984, 1985; Baker & Anderson, 1982). Training programs aimed at improving comprehension strategies might be useful for many low-literate adults.

Other text-reading strategies may also be useful as part of an adult literacy program. Advance organizers or outlines, for example, can help a reader to establish relevant text concepts and anticipate the structure of the text (Mayer, 1983). Repeated readings of a text also improve scores on comprehension tests for adults (Amlund, Kardash, & Kulhavy, 1986; Haenggi & Perfetti, 1992; Samuels, 1979), as well as for children (Herman, 1985; Rashotte & Torgesen, 1985; Taylor, Wade, & Yekovich, 1985). Repeated readings have several benefits: They increase the familiarity of words (making them more readable in the future); they allow second chances at comprehension; and through memory of previous readings, they reinstate contexts to support interpretation and repair of comprehension.

Example of a Successful Program

With the range of reading and non-academic problems of people entering literacy programs, such programs face the impossible task of offering everything to everyone. While the evaluation of literacy programs is beyond the scope of this paper, we examine how one program, the Pittsburgh Adult Competency (PAC) Program (Bean & Johnson, 1987), attempts to meet the diverse needs and goals of its participants.

The participants in the PAC program lack skills necessary for reading and for everyday functioning. Bean and Johnson (1987) report that these adults score at the zero- to sixth-grade level on standardized reading tests, have a history of academic failure, and have self-esteem and affective problems related to their academic failure.

The demographics of the participants in the PAC program are similar to those of other adults with literacy problems; the success of the students and of the program, however, is not. Likewise, the success of the PAC program differs from other literacy programs. Just a few numbers indicate the success of the program:

> *...average daily attendance rates of 85%; completion rates of 95%; average job placement and additional training placement rates of 50%; average gain in reading of 1.0 grade equivalent in a 2-month period; average gain in math computation of 0.9 grade equivalent in a 2-month period; and measured increases in positive attitude toward learning and reading. (Bean & Johnson, 1987, pp. 1-2)*

Bean and Johnson note that these numbers are impressive when compared with other adult literacy programs, which typically have drop-out rates approaching 80%. The components of the program relate directly to its success. The skills of the students are evaluated thoroughly as they enter the program. This initial assessment is a realization that adults have different skills as they enter, and that they need attention directed to those skills that are weakest.

Those adults who lack decoding skills receive training in word recognition; those who lack metacognitive skills receive training for their needs. Reading materials satisfy the interests of the adult, and they often include materials about which the adult already has background knowledge. The progress of each student is carefully tracked throughout the 10-week session. The program also trains all adults in other practical, functional skills (like those skills assessed by the NAEP report; Kirsch & Jungeblut, 1986)—how to write out a check, how to use a calculator, how to write a resume, how to act in a job interview, and other communicative skills.

The PAC program attacks the motivational issue head-on. From the beginning, participants are told that the skills they will be learning will help them find a job. The program, in fact, is intricately tied to helping participants find a job. The first weeks of the program are devoted to teaching skills, but the final week is a job-search week. Counselors visit and provide relevant information for finding a job.

The success of the participants in this program suggests that it is a valid model for other literacy programs: The instruction is individualized and based on assessment of skills; the program is goal-directed, in that it teaches students the skills necessary for a job and then provides help in finding a job. Finally, the instructors and directors of the program are knowledgeable about the cognitive and linguistic skills of the participants and are familiar with the relevant research about the instruction. Bean and Johnson's program presents a well-mixed blend of instruction in basic linguistic skills and functional skills, as well as a blend of literacy training and vocational training. This blend allows it to address simultaneously the students' skill acquisition and motivational deficiencies. By fulfilling the varied needs of its students, the PAC program encompasses narrow and broad definitions of literacy.

CONCLUSIONS

What has an analysis of reading acquisition by children provided for dealing with problems of adult literacy education? We first summarize the key elements of our analysis:

- *The definition of literacy matters.* We distinguished between a narrow and broad definition, pointing out that both are legitimate for specific purposes. The narrow definition identifies literacy acquisition with learning how a writing system works, whereas the broader definition refers to the functional contexts of basic literacy. The definitions are ordered in applicability on logical and empirical grounds: There is no extended functional literacy in the absence of learning how one's writing system works.
- *Learning to read English (and other alphabetic writing systems) requires mapping meaningless speech units to meaningless writing system units.* All full writing systems, even Chinese, rest on speech, not meaning. An alphabetic system allows great productivity in reading. The successful

reader must learn this print-speech system one way or another to be successful in reading this system. An important component of this learning is phonological knowledge, the understanding that spoken language can be decomposed into meaningless segments.

- *The development of reading skill rests on phonological and orthographic components.* Some phonological knowledge assists learning how to read, while practice at reading strengthens the orthographic-phonological representations of words that are critical in fluent reading. Practice improves the quality of word representations. Children who experience initial success in reading acquire more practice, hence the gap between successful and unsuccessful readers widens.
- *Comprehension is a critical part of reading.* Its importance is high from the very beginning of reading, although it is largely a general language ability rather than a reading-specific one. Much of what makes comprehension problematic for readers originates in lack of knowledge, and if literacy programs are to have a chance of working, they cannot take on the responsibility for correcting serious knowledge deficiencies.
- *Low-literate adults share many of their problems with children who have difficulty learning to read.* Failures in phonological and lexical processes are the hallmark of children who have difficulty learning to read and who are reading disabled. These same phonological and lexical failures are characteristic of adults who experience reading difficulty.
- *Adult literacy instruction in phonological and lexical (decoding) processes can be beneficial to many adult illiterates.* Several studies point to adult problems in lexical and phonological processing, and some studies now suggest successful training in phonological awareness.
- *For low-literate adults who show sufficient basic literacy skill, instruction should focus on reading practice.* The benefits of practice extend from improving the quality of lexical representations through learning, which aids further gains in literacy, and increased interest in reading. Practice can include training in comprehension skills.
- *There are differences between low-literate adults and beginning readers that must be considered in instruction.* Beyond obvious differences in age and experience are differences in goals and motivations. Adult interest in success can provide a leverage on instruction. Adaptations of instruction to individual goals are important.

Things are more complex than the above summary indicates, of course, and some of these complexities are important in considering how to provide instruction for adults. As our previous discussion pointed out, the parallels between child learners and adult learners include aspects of the broader, non-linguistic definition. Less skilled child and adult readers may need training in

metacognitive skills and strategies to bring them to the level of more skilled readers.

One way to sum up research on adult literacy acquisition is to say that we know enough about some things, but not quite enough about others. We know enough about the nature of the phonological processing deficits of adults; we are aware that training programs should have already been addressing these problems, and that researchers by now should have assessed the results of the programs. This is a clear case for which research can inform instruction in reading. At the same time, we still know too little about the course of learning to read as an adult. For example, we know nothing about how the word representations of adults change as they move from nonliteracy through various degrees of learning the writing system. More practically, we know little about how the adult's background, literacy goals, and support systems mediate the effects of reading programs. To make this problem concrete, we noted that there appears to be resistance to training in decoding on the part of adult literacy educators. It is likely that an implicit assumption behind this resistance is that adult learners might be turned off by instruction that seems remote from their goals of real reading achievements. Indeed, this is a serious possibility and should be examined. However, it is also possible that a motivated adult learner will accept and even expect a little basic training as a means to a goal of learning how to read. There is virtually no complex skill for which training in the basics, even in isolation, is not a critical component. Thus, people who want to learn to play tennis or golf receive training in basic strokes in isolation. Only in academic subjects, especially reading, does one hear absolutist admonitions against skill training. However, an adult who cannot read or write more than a memorized word or two might find it quite exciting to learn to read some words. As we have emphasized, word reading should never be all there is to instruction. But for it not to be part of the instruction for the many adults who need it is ill-advised.

Finally, we return to the question that we posed at the beginning: Is learning to read more like learning a language or more like learning to play chess? If language learning is the better analogy, then adult literacy acquisition might be dramatically different from children's literacy acquisition. If chess is the better analogy, then the differences between adults' and children's learning are minor. We conclude that both analogies are flawed to some extent. Reading, unlike language, is not natural; nor, as in the case of chess, is it the kind of conventionalized learning that is indifferent to critical periods. Instead, reading relies on a foundation of the natural—the language abilities of the learner—onto which is built a conventionalized writing system. The failures at learning are varied and complex, but many, perhaps most, seem to arise from not figuring out the nature of the writing system or from not having the opportunity to practice working with the system. These failures are not dramatically different for adults, suggesting the chess analogy. But after long-term failure and lack of effective functioning in literacy, learning becomes more difficult. Programs to reverse the failure must confront the basic problem of learning the writing system in a way that recognizes these added obstacles.

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APPENDIX

Figure 1 *Graphical representations of the definitions of literacy* *A-ii*
Figure 2 *Development of redundant phonemic information* *A-iii*

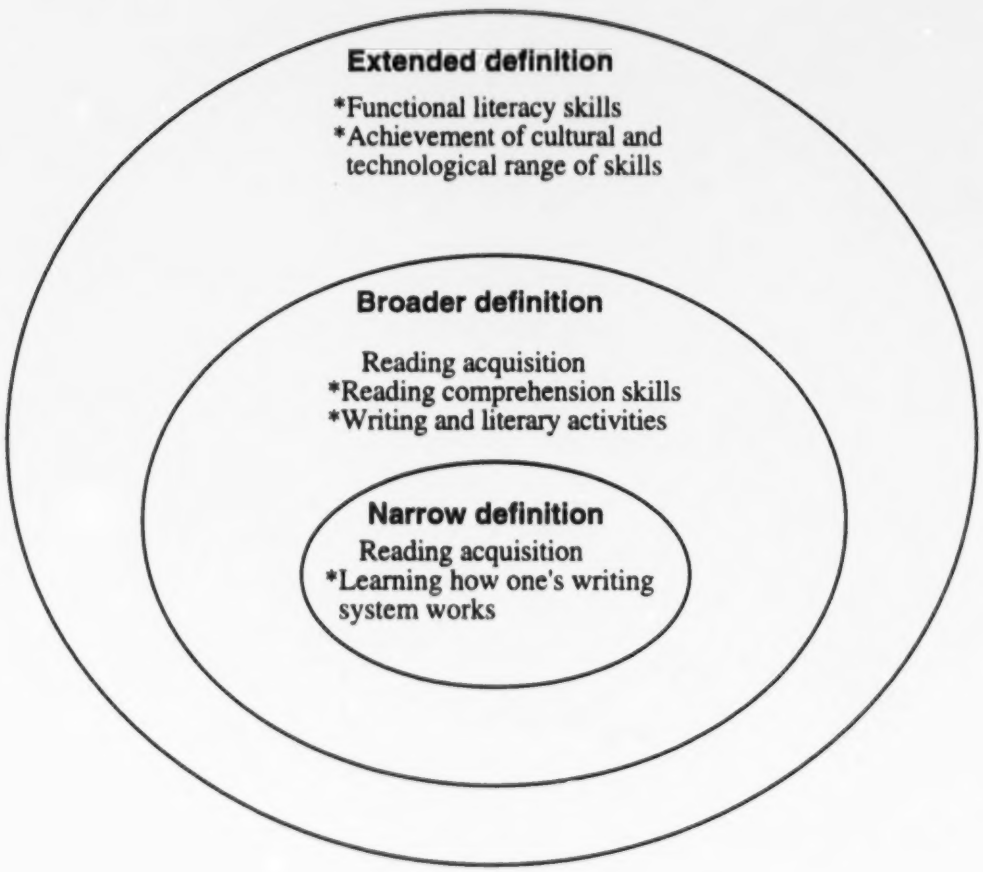

Figure 1. Graphical representation of the definitions of literacy. The narrow definition of literacy is entailed within the broader definitions. See text for explanation.

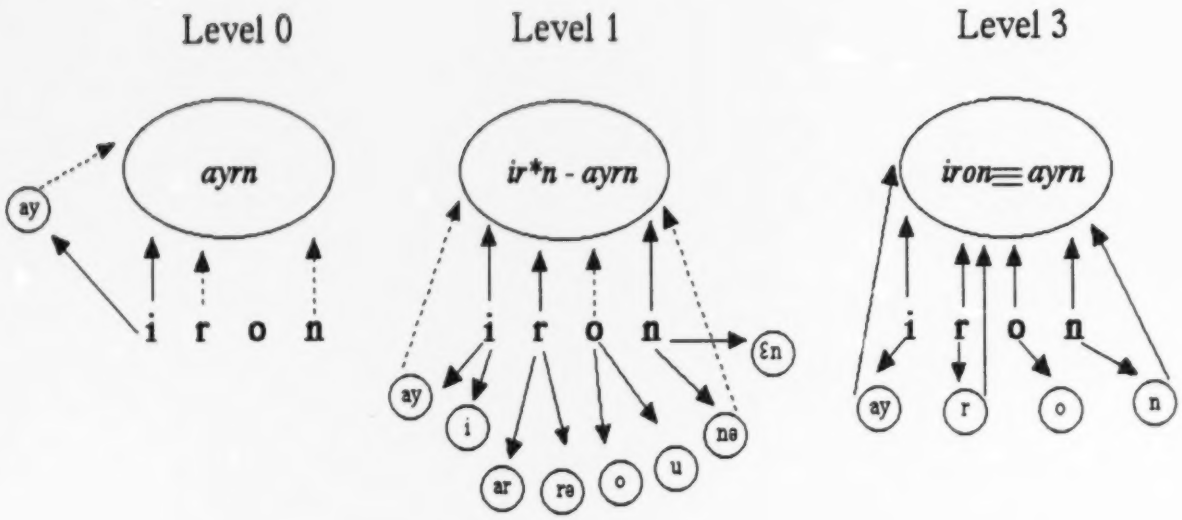

Figure 2. Development of redundant phonemic information over three hypothetical levels of reading acquisition. The large circles are word representations containing spellings and pronunciations (a pronunciation only at Level 0), and the small circles are phonemes and phoneme sequences that are associated with specific letters. Thus each level represents the word *iron*, but the form of the representation begins as a phonemic object at Level 0, includes variable orthographic information at Level 1, and at Level 3 includes a fully specified orthographic representation "bonded" to the phonemic representation. (An analogy to chemical bonding is intended.) Meanwhile, the representation of phonemes changes in two directions, beginning impoverished at Level 0, proliferating at Level 1, and by Level 3 reducing to mainly those that are sensitive to the orthographic context imposed by the word *iron*. The solid lines indicate strong activation patterns and the dashed lines weak ones. Figure taken from Perfetti (1992).